

R E M A R K S

This is in response to the Office Action that was mailed on May 13, 2002. Applicants are disappointed to note that the Examiner has reversed his previous indication – during a personal interview on January 17, 2002 – that the claims were allowable over the prior art of record.

In order to clarify differences between the present invention and the cited references, all of the claims herein are amended to specify that the cellulose acetate of the present invention is cellulose triacetate. See, e.g., lines 10-12 on page 28 of the specification. Claim 13 is amended to recite that the average degree of acetylation of the cellulose triacetate is “58 to 62.5%”. See the specification, page 8, line 24 to page 9, line 2. Claim 22 is amended to depend from claim 17. Claim 18 is amended to specify that the dope contains an organic solvent -- see the specification, page 27, lines 8-9. New claim 23, which specifies that the organic solvent of the dope is a halogenated hydrocarbon, is based upon such disclosure as lines 9-13 on page 10, lines 3-7 on page 11, and lines 9-14 on page 27. No new matter is introduced by these amendments, nor are any new issues raised thereby. Accordingly, entry of this Amendment in order to place the application into condition for allowance, or into better condition for appeal, is respectfully solicited. With this Amendment, claims 1-13, 15-18, 20, 22, and 23 are in the case.

As explained in detail on pages 8-10 of the Amendment that was filed on February 21, 2002, cellulose in its original form contains carboxyl groups, and thus the carboxyl groups of cellulose acetates originate from the cellulose from which those acetates are produced. This is documented in “Cellulose

Handbook”, pages 258-259 (1963) and TAPPI Standard T237 om-83. This information was made of record in the Amendment filed January 27, 2000.

Claims 1 and 4-7 stand rejected under 35 U.S.C. §102(b) as being anticipated by US 4,426,481 (Sullivan). Nowhere does Sullivan disclose reacting cellulose with a reactant consisting essentially of acetic anhydride, which is an explicit requirement of the present claims. Claims 1 and 4-7 stand rejected under 35 U.S.C. §102(b) as being anticipated by US 3,816,150 (Ishii). Nowhere does Ishii disclose reacting cellulose with a reactant consisting essentially of acetic anhydride, which is an explicit requirement of the present claims. Claims 1-13, 15-18, and 20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Sullivan in view of US 4,888,147 (Mochida). Claim 17 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Sullivan and Mochida in view of Ishii. Claims 18 and 20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over US 5,240,665 (Seo) in view of Ishii. All of the rejections of record are respectfully traversed.

The cited references

Sullivan discloses a polymeric product, prepared by polymerization in an alkaline environment, adapted to utilization among other things as a diffusion control layer in diffusion transfer film units or as an interlayer or overcoat in photosensitive elements. Sullivan indicates that US Patent No. 3,362,819 discloses an image-receiving element comprising a support layer, made up of, in sequence, *a polymeric acid layer*, an inert timing or spacer layer, and an image-receiving layer. Column 4, lines 59-66. Sullivan further teaches that

the acid polymer layer effects a reduction in the pH of the image layer, from a pH of about 12-14 to a pH at least as low as 11. Column 5, lines 41-44. Moreover, *in order to prevent premature pH reduction during transfer processing, as evidenced for instance by an undesired reduction in positive image density, the acid groups are disclosed to be so distributed in the acid polymer layer that the rate of their availability to the alkali is controllable.* Column 5, lines 53-58. Also, *the polymeric acid may be made of a free carboxyl group-containing dibasic acid half-ester derivative of cellulose, e.g., cellulose acetate hydrogen phthalate, cellulose acetate hydrogen glutarate, carboxymethyl hydroxyethyl cellulose, and sodium carboxymethyl cellulose.* column 5, lines 20-40; Examples 1-10, 11-15, 16-19, and 30.

Ishii discloses a process for making modified cellulose acetate object having improved solvent resistance. The Ishii process comprises forming or molding mixed cellulose ester made by *esterifying cellulose with acetic acid and polybasic carboxylic acid*, and treating the formed or molded product with an aqueous solution of a water soluble *polyvalent metal salt*. Ishii further discloses that the mixed ester of cellulose, which is like cellulose acetate, is treated with a *divalent or higher metal salt to increase its solvent resistance.* Column 2, lines 37-40. Ishii indicates that *the treated cellulose acetate is insoluble in acetone.* Examples, Tables 1 to 7. Moreover, Ishii discloses that the degree of substitution of the hydroxyl groups of cellulose by acetate groups is at least 2.3, that the degree of substitution of the hydroxyl groups of cellulose by polybasic carboxylic acid groups is at least 0.15, and that the total degree of substitution of the hydroxyl groups of cellulose is at least 2.4. See e.g. Ishii claim 3.

Mochida discloses a process for producing a cellulose acetate molding material. The Mochida process comprises *dissolving cellulose diacetate in a mixed solvent of acetone and water* to prepare a dope and then dry spinning or dry film forming the dope. In Mochida, at least one water-soluble salt or base is dissolved in the water to be used in the preparation of the dope, in an amount of 2×10^{-4} to 1×10^{-2} gram equivalent/kg (the cellulose diacetate), thereby *preventing formation of acetone-insoluble gels*. *The acetyl value of cellulose diacetate is about 55%*. Column 1, lines 26-28. Mochida disclose alkali metal, alkaline earth metal, and ammonium salts or inorganic acids as the water-soluble salts and bases. Column 2, line 54 to column 3, line 14. Specifically exemplified as preferred are disodium hydrogen phosphate, sodium dihydrogen phosphate, and so on. Column 2, lines 62-68. Furthermore, Mochida teaches that *the formation of acetone-insoluble gels is caused by the presence of a small amount of free acid in cellulose diacetate and that the presence of hydrogen ions resulting from the free acid markedly accelerates the hydrolysis of cellulose acetate, due to thermal hydrolysis of the dope*. Column 1, line 64 to column 2, line 4. Note that *the acetone-insoluble gels are mainly made of cellulose acetate having a low acetyl value*. Column 1, lines 50-51.

Seo discloses a process for producing cellulose acetate fiber. The Seo process comprises mixing *cellulose acetate, acetone, metal oxide precursor, acid, and water*, then filtering and spinning the solution. Seo discloses that the cellulose acetate preferably has a degree of substitution of 2.5 of acetyl. Column 3, lines 44-48. Further, Seo indicates that cellulose acetate fiber is produced from a cellulose acetate-acetone dope solution by a dry spinning technique. Column 1, lines 31-34. The production speed is significantly increased without "aggravating" the tensile properties of the resulting materials

by incorporating acid, water, and metal oxide precursor into an extrudable solution such as cellulose acetate/acetone spinning solution. Column 2, lines 16-24. Furthermore, Seo teaches that the increased speed is believed to be the result of a reduction in viscosity of the production spinning solution. Column 2, lines 22-24. Seo discloses that the addition of the metal oxide precursor has a dilution effect on the spinning solution and enhances the threadline strength. Column 2, lines 33-39.

Comparison of the present invention and the cited references

The cited references fail to teach or suggest not only cellulose triacetate but also an important role of the free carboxyl groups bonding directly to the cellulose triacetate. Note that cellulose *di*acetate is soluble in acetone or a mixture of acetone and water. Specification, page 38, lines 2-4. In contrast, cellulose *tri*acetate is insoluble in acetone or a mixture of acetone and water. Specification, page 10, lines 9-13 and page 11, lines 3-7.

In more detail, since the polymeric acid of Sullivan is a *di*basic acid half-ester derivative of cellulose, the Sullivan polymeric acid is clearly distinct from cellulose *tri*acetate.

The cellulose acetate of Ishii differs from cellulose triacetate, too, as is apparent from the fact that the degree of substitution of the hydroxyl groups of cellulose by polybasic carboxylic acid groups in Ishii is at least 0.15 and the cellulose acetate treated by polyvalent metal in Ishii is insoluble in acetone. Note that the carboxyl groups of the Ishii cellulose acetate are utilized for crosslinking the Ishii cellulose acetate by a polyvalent metal for the formation of the acetone-insoluble or solvent-resistant cellulose acetate.

The cellulose acetate of Mochida is a cellulose diacetate that is soluble in acetone, and is thus clearly distinct from cellulose triacetate, which is insoluble in acetone.

Since the cellulose acetate of Seo is soluble in a mixture of acetone and water, the cellulose acetate of Seo also differs significantly from the cellulose triacetates of the present invention.

Thus the cellulose triacetates of the present invention are clearly distinct from the cellulose derivatives of the cited references. Accordingly, since none of the cited references teaches or suggests a cellulose triacetate, even if these references were combined, the cellulose triacetates of the present claims would not be obvious therefrom to a person having ordinary skill in the art.

Unexpected advantages

The present invention provides unexpected advantages. Not one of the cited references teaches or suggests an important role, in connection with the releasability and spinnability of the dope, of the free carboxyl groups bonding directly to the cellulose triacetate.

In more detail, carboxyl groups of the cellulose derivative of Sullivan reduce pH of the image layer in order to improve the diffusion image layer, but the improvement of diffusion image layers has no relevancy to the releasability of a dope. Thus the releasability of the cellulose triacetate composition of the present invention would not be expected based upon the teachings of Sullivan, it being noted that there are significant differences in function between the carboxyl groups of dibasic acid half-esters of cellulose as in Sullivan and carboxyl groups of cellulose triacetate as claimed herein.

Regarding Ishii, the improvement in the solvent resistance sought by Ishii is irrelevant to releasability of a dope. In particular, carboxyl groups of polybasic carboxylic acids act as functional groups for increasing solvent resistance, which is significantly different from dope releasability. Thus the improved releasability of the cellulose triacetate dopes of the present invention is not predicable from Ishii.

Mochida teaches that the formation of acetone-insoluble gels is caused by the presence of free acid in cellulose diacetate and the free acid markedly accelerates the hydrolysis of cellulose acetate due to thermal hydrolysis of the dope. In particular, Mochida not only focuses on cellulose diacetate having a low acetyl value but also adds a water-soluble metal salt to the dope containing cellulose diacetate to prevent the formation of acetone-insoluble gel. As is apparent from this, Mochida denies the usefulness of the carboxyl groups of cellulose acetate having a low acetyl value (in other words, free carboxyl groups of cellulose triacetate). Thus the improvement in releasability of a dope containing cellulose triacetate is not expected based upon the teachings of Mochida.

Similarly, the cellulose acetate of Seo is soluble in acetone and is not cellulose triacetate which is insoluble in acetone. Seo teaches reduction of viscosity of the dope by addition of a metal oxide precursor. Seo fails to teach or suggest an important role of carboxyl groups in cellulose triacetate. Thus the improved releasability of a dope containing cellulose triacetate would not be predicted by Seo.

In accordance with the present invention, since free carboxyl groups of the cellulose triacetate are retained or generated, the resulting cellulose triacetate is dramatically improved in releasability, optical characteristics, and

spinnability. These advantages of the cellulose triacetate of the present invention are not predictable based upon the teaching of the cited references.

Previous arguments

Applicants' previous rebuttal of the rejections of record, which were set forth on pages 13-18 of the 21 February 2002 Amendment, are incorporated herein by reference. The Examiner's sole comment on Applicants' previous arguments reads:

Applicant's explanation for the generation of free carboxyl groups that are attached directly to the cellulose for features (ii) and (iii) on pages 8-11 of their response filed February 21, 2002 was not persuasive. On page 8, at the beginning of the 2nd paragraph, Applicants state that "cellulose inherently has carboxyl groups, and thus carboxyl groups of a cellulose acetate are originated from cellulose." This statement is not correct since the structure of cellulose does not contain carboxyl groups. Cellulose is a carbohydrate polymer of 1,4- β -linked glucopyranose units in the walls and skeletons of vegetable cells.

The Examiner's attention is respectfully drawn again to the documented explanation presented on pages 8-9 of the 21 February 2002 Amendment. Moreover, as discussed by Applicants in the paragraph bridging pages 5-6 of the specification, "real world" cellulose – as opposed to the theoretical cellulose mentioned by the Examiner – affects films derived therefrom. For instance, cellulose acetate films produced from hardwood pulp are generally inferior in releasability and cellulose acetate films produced from softwood pulps are inferior in transparency and/or spinnability. This invention has found a way to overcome such problems. See lines 8-15 on page 3 of the specification. The

statement by Applicants on page 8 to which the Examiner took exception was not even made in the context of distinguishing the present invention over the references. Applicants discussed the references on pages 11-18 of the 21 February 2002 Amendment. The Examiner is respectfully requested to, again, withdraw the prior art rejections, or at least **to respond to Applicants' discussion of the references** (Amendments pages 11-18, not page 8).

Summary and conclusion

Sullivan and Ishii fail to teach or suggest that there is a relationship between (a) the slurry pH value and/or the free carboxyl groups bonding directly to the cellulose acetate and (b) the releaseability and/or spinnability of the dope made therefrom. The improvements in releaseability and/or spinnability of the dope, which is provided by the present invention, is not predictable from Sullivan and Ishii. Mochida neutralizes the residual free acid remaining in his cellulose acetate with buffer reagent or bases, so the improved releaseability or optical characteristics would not be provided by Mochida's approach either. Seo likewise fails to disclose or suggest a role of free carboxyl groups binding to cellulose acetate. Even if the references are combined, the improvements in releaseability and other characteristics of the dope is not expected, because no *reference teaches the significance of free carboxyl groups in the cellulose acetate compounds.*


If any issues remain to be resolved in this application, the Examiner is requested to contact Richard Gallagher (Reg. No. 28,781) at (703) 205-8008.

Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), the Applicants hereby petition for an extension of one (1) month to September 13, 2002, in which to file a reply to the Office Action. The required fee of \$110.00 is enclosed herewith.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §1.16 or under 37 C.F.R. §1.17, particularly extension of time fees.

Respectfully submitted,

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Attachment: Version with Markings to Show Changes Made

VERSION WITH MARKING TO SHOW CHANGES MADE

1. (five times amended) A cellulose triacetate compound obtained by the reaction of a cellulose, which may contain a hemicellulose, with a reactant consisting essentially of acetic anhydride in the presence of a sulfuric acid catalyst and having at least one feature selected from the group consisting of:

(i) said cellulose triacetate compound has carboxyl groups wherein at least part of the carboxyl groups are free carboxyl groups;

(ii) said cellulose triacetate compound contains at least one member selected from the group consisting of an acid having an acid dissociation exponent pKa of 1.93 to 4.50 in water, an alkali metal salt of said acid, and an alkaline earth metal salt of said acid; and

(iii) said cellulose triacetate compound contains an alkali metal or an alkaline earth metal, wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose triacetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent,

wherein said cellulose triacetate compound is soluble in an organic solvent.

2. (four times amended) A cellulose triacetate compound according to Claim 1 having at least feature (iii), wherein the total content of the alkali metal and the alkaline earth metal in 1 gram of the cellulose triacetate is 2.5×10^{-6} equivalent or less in terms of ion equivalent.

3. (four times amended) A cellulose triacetate compound according to Claim 2, wherein the total content of the alkali metal and the alkaline earth

metal in 1 gram of the cellulose acetate is 1×10^{-6} equivalent or less in terms of ion equivalent.

4. (four times amended) A cellulose triacetate compound according to Claim 1 having at least feature (ii), wherein the acid has a pKa value of 2.0 to 4.4.

5. (four times amended) A cellulose triacetate compound according to Claim 1 having at least feature (ii), wherein the acid of feature (ii) is at least one organic acid selected from the group consisting of an aliphatic monocarboxylic acid, an aliphatic polycarboxylic acid, a hydroxycarboxylic acid, and an amino acid.

6. (four times amended) A cellulose triacetate compound according to Claim 5, wherein the acid of feature (ii) is at least one organic acid selected from the group consisting of a saturated or unsaturated C₁₋₃ monocarboxylic acid, a saturated or unsaturated C₂₋₄ dicarboxylic acid, a C₁₋₆ hydroxycarboxylic acid, and an amino acid.

7. (four times amended) A cellulose triacetate compound according to Claim 6, wherein the acid of feature (ii) is at least one member selected from the group consisting of formic acid, haloacetic acid, halopropionic acid, acrylic acid, malonic acid, succinic acid, glutaric acid, fumaric acid, glycolic acid, lactic acid, malic acid, tartaric acid, and citric acid.

8. (four times amended) A cellulose triacetate compound according to Claim 1 having at least feature (ii), wherein the total content of the acid of feature (ii), the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-9} to 3×10^{-5} mole relative to 1 gram of the cellulose triacetate.

9. (four times amended) A cellulose triacetate compound according to Claim 8, wherein the total content of the acid of feature (ii), the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-8} to 2×10^{-5} mole relative to 1 gram of the cellulose triacetate.

10. (four times amended) A cellulose triacetate compound according to Claim 9, wherein the total content of the acid of feature (ii), the alkali metal salt of the acid, and the alkaline earth metal salt of the acid is 1×10^{-7} to 1×10^{-5} mole relative to 1 gram of the cellulose triacetate.

11. (thrice amended) A cellulose triacetate composition comprising the cellulose triacetate compound of Claim 1 in the form of a slurry, wherein the slurry has a pH of 4.5 to 5.5.

12. (four times amended) A cellulose triacetate composition according to Claim 11, wherein the slurry has a pH of 4.8 to 6.0.

13. (thrice amended) A cellulose triacetate compound according to Claim 1, wherein the average degree of acetylation is from ~~58 to 62.5%~~ [43.7 to 62.5%].

15. (thrice amended) A cellulose triacetate compound according to Claim 1, wherein the cellulose as a raw material is at least one member selected from the group consisting of a wood pulp and a linter pulp.

16. (four times amended) A cellulose triacetate compound according to Claim 15, wherein the cellulose as a raw material is at least one member selected from the group consisting of a hardwood pulp and a softwood pulp.

17. (four times amended) A method of producing a cellulose triacetate compound claimed in Claim 1, which comprises:

(i) mixing a cellulose triacetate, and an acid having an acid dissociation exponent pK_a of 1.93 to 4.50 in water or the metal salt thereof, to give a slurry pH of 4.5 to 6.0;

(ii) treating a cellulose triacetate with said acid or said metal salt thereof to give a slurry pH of 4.5 to 6.0; or

(iii) adding an alkali metal salt of said acid or an alkaline earth metal salt of said acid to a cellulose triacetate, such that the total content of said alkali metal and said alkaline earth metal in 1 gram of the cellulose triacetate is 5.5×10^{-6} equivalent or less in terms of ion equivalent, to give a slurry pH of 4.5 to 6.0.

18. (twice amended) A dope containing the cellulose triacetate compound according to Claim 1 and an organic solvent.

20. (thrice amended) A method for improving the releasability of a film from a support which comprises casting [the] a dope of Claim 18 on the support.

22. (twice amended) A method of producing a cellulose triacetate according to Claim 17, [compound] which comprises treating a cellulose with acetic acid, acetylating with a reactant consisting essentially of acetic anhydride in the presence of a sulfuric acid catalyst to produce a cellulose triacetate, and hydrolyzing or aging the cellulose triacetate using sulfuric acid as a catalyst.

Claim 23 has been added.